

(To be inserted into Chapter 8 of the Climate Action Team Report)

8 ECONOMIC ASSESSMENT

This section discusses the results from a preliminary assessment of the macroeconomic impacts associated with the climate change emission reduction strategies presented in this report. The results show that the overall impacts of the climate change emission reduction strategies are expected to be positive. Specifically, when the strategies already underway as well as new strategies being proposed are considered in total, the resulting impacts on the economy are expected to translate into job and income gains for Californians.

In summary, the net impact of the strategies on jobs in year 2020, when the strategies are expected to be fully implemented, is expected to be a gain of 83,000 above what the California economy would gain without the climate change emission reduction strategies. The implementation of the strategies is also likely to add an additional income of about \$4 billion to Californians in 2020, again, above what the economy is expected to produce without the strategies.

These favorable impacts on the economy are possible because of the reduced operating costs associated with many of the strategies. The additional job growth is expected to come from a net savings to consumers associated with the implementation of the strategies. The savings will in turn promote further business expansion and job creation.

The results presented in this section are considered preliminary because the cost and potential savings information associated with most of the individual strategies have not yet been fully developed. Therefore, when available, other sources have been drawn on to provide an initial assessment of the costs and savings. Although this analysis needs refinement, we expect that the fundamental conclusion--that the suite of strategies discussed in this report has a net positive impact on California's economy--will stand.

The subsequent refined analysis will incorporate updated cost and savings estimates for the strategies. It will also assess the cost effectiveness of the various individual strategies. Thus, the refined economic analysis will provide additional information to decision-makers as they proceed with implementation of the strategies.

The remainder of this section discusses the model of the California economy used for the assessment, the analysis of the strategies in Tables 5-1 and 5-2, a discussion, as well as a summary.

8.1 Economic Model

This economic assessment uses a computable general equilibrium (CGE) model of the California economy called E-DRAM, developed by the University of California, Berkeley. It has been used by the Department of Finance for the revenue impacts of tax and other State policies, by the California Energy Commission and ARB to assess impacts of reducing petroleum dependency (AB2076)¹, and by ARB for the Vehicle Climate Change Standards², the State Implementation Plan³ analysis, and others. As a part of the application of the model to these analyses, it has been peer reviewed and calibrated to be representative of the California economy.

A CGE model simulates the functioning of a market economy in which different sectors interact with one another (one sector supplies inputs to another, or purchases the outputs of another) and where prices and production adjust in response to changes caused by government policies applied to specific sectors. The CGE simulates these relationships among California producers, California consumers, government, and the rest of the world. Because of the interconnection between sectors, an intervention in one sector has impacts on others, which are captured by the CGE model analysis.

The inner workings of the CGE model can be graphically illustrated. Figure 8-1 shows a simplified version of the sectors that interact and participate in goods, services, and labor flows that make up the economy. The diagram shows that the households sell factors of production (labor and capital) to the firms which use the factors to produce goods and services to sell to the households. It also shows the flow of payments that accompany the transactions between the firms and the households. The diagram includes the flow of transactions between the firms; this is, how the firms buy and sell intermediate goods amongst themselves to produce the final products sold to the households.

¹ CEC 2004. Attachment to Appendix A (Revised): Impacts of Petroleum Reduction Strategies on the California Economy. At http://energy.ca.gov/fuels/petroleum_dependence/documents/2004-02-10_ATCHMNT_APNDX_A.PDF

² ARB 2005a. Regulations To Control Greenhouse Gas Emissions From Motor Vehicles: Final Statement Of Reasons. At <http://www.arb.ca.gov/regact/grnhsgas/fsor.pdf>

³ ARB 2003, 2003 State and Federal Strategy for the California State Implementation Plan. At <http://www.arb.ca.gov/planning/sip/stfed03/stfed03.htm>

Figure 8-1 Circular Flow of Goods and Services in the Economy

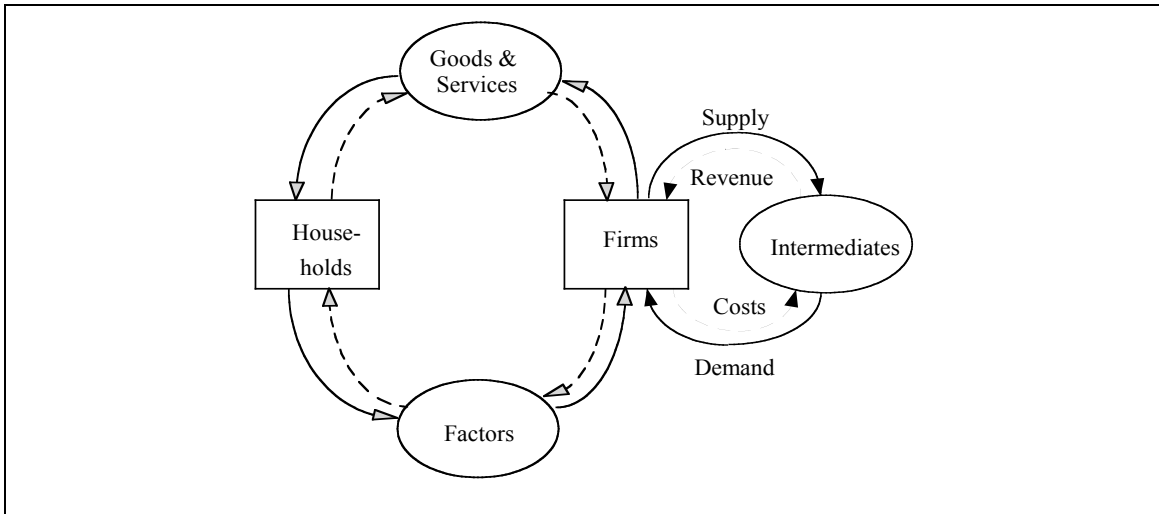
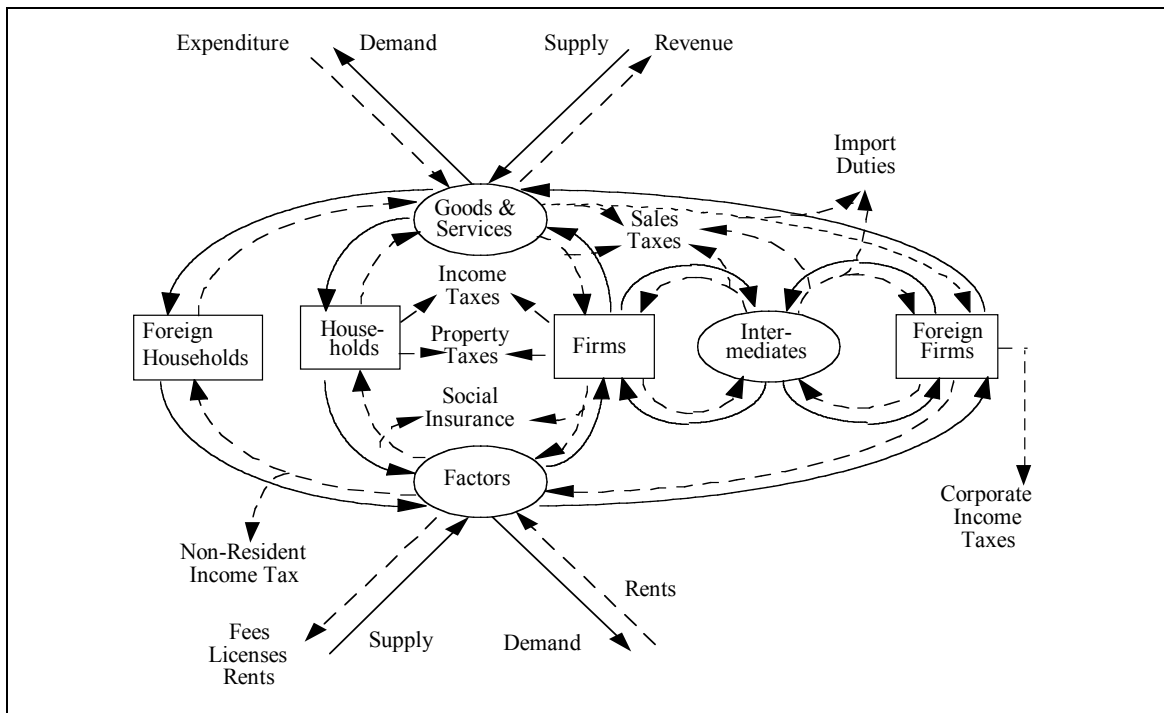


Figure 8-2 shows the complexity of the complete California economy and the many sectors involved in producing goods and services for final consumption by the households inside and outside of California.

Figure 8-2 Complete Circular Flow of Goods and Services in the Economy



The E-DRAM model accounts for all of the flows in the California economy using many equations. When a regulation or a policy is adopted that could

affect costs of production in one part or sector of the economy, the rest of the economy has to adjust to the perturbation through price or employment changes. The CGE tracks the changes and produces results that show how much each sector has changed. The main economic indicators are number of jobs and income. It is believed that these two key indicators are particularly informative for characterizing the impact of potential policies on California's economy. Jobs are an important indicator for decision-making, and income closely follows the gross state product, which is an indicator of overall economic well-being in the State. This economic assessment presents the changes in these two indicators as the net economic impacts of the strategies.

8.2 Analysis of Climate Change Emission Reduction Strategies

The strategies evaluated in this analysis are taken from Table 5-1 (strategies underway in California) and Table 5-2 (proposed strategies). The objective of the analysis is to draw on available cost and savings data to provide an overall assessment of the impact of the strategies on California's economy.

The E-DRAM model of the California economy was run with the strategy costs and savings as inputs into the model to assess the economic impacts for years 2010 and 2020. Two major economic indicators were selected to demonstrate economic well-being. Job creation indicates a healthy economy providing opportunities to Californians. Income is an indicator of the output of goods and services and therefore gauges progress in economic activity. The impacts are shown as the difference between the predicted economic indicators with and without implementation of the strategies.

Table 8-1 shows the impacts of the strategies on income and employment in 2010. Many of the strategies have both costs and savings. Generally, the costs are incurred for technology and/or changes in behavior that reduces emissions, and savings are accrued from reduced operating costs. The costs of the strategies for the year 2010 are estimated at \$1.3 billion, and the savings at \$2.9 billion for a net savings of \$1.6 billion. The net savings stimulate additional economic activity and generate about \$2 billion of additional income (about a 0.13% increase in total income) and 19,000 new jobs (about 0.11% of the 2010 total employment). For context, Tables 8-1 and 8-2 also show the growth expected for the economy between 2004 and 2010 or 2020 irrespective of the strategies discussed in this report.

Table 8-1. Impacts of Achieving the Climate Change Emission Reduction Targets on California Economy in 2010*

Economic Indicator	In 2004	Without the Strategies**	With the Strategies	Impacts	Percentage of the Total
Income (Billions of 2005\$)	1,317	1,527	1,529	2	0.13%
Employment (thousands)	16,460	17,969	17,988	19	0.11%

* We display several digits to make it clear how we calculated the difference associated with the strategies.

** This column indicates the income and employment forecast for 2010 without the implementation of the strategies presented in this report. Note that between 2004 and 2010, the economy is expected to realize substantial growth (e.g., income increases by about \$200 billion while the number of jobs increase by about 1.5 million).

By 2020, additional savings from the strategies stimulates the economy further. The strategy costs are on the order of \$7.9 billion, with a savings of \$16.9 billion for a net savings of \$9.0 billion. Table 8-2 shows the impacts of the strategies in 2020. The results also reflect the fact that the strategies that would be in effect by 2020 have a different mix of costs and savings than those in 2010. The impact on income is about \$4 billion, about a 0.19% increase, and the impact on jobs is creation of 83,000 new jobs, about a 0.40% increase, in the year 2020 for the California economy.

Table 8-2. Impacts of Achieving the Climate Change Emission Reduction Targets on California Economy in 2020*

Economic Indicator	In 2004	Without the Strategies**	With the Strategies	Impacts	Percentage of the Total
Income (Billions of 2005\$)	1,317	2,128	2,132	4	0.19%
Employment (thousands)	16,460	20,704	20,787	83	0.40%

* We display several digits to make it clear how we calculated the difference associated with the strategies.

** This column indicates the income and employment forecast for 2020 without the implementation of the strategies presented in this report. Note that between 2004 and 2020, the economy is expected to realize substantial growth (e.g., income increases by about \$800 billion while the number of jobs increase by about 4.3 million).

Although these of the economic impacts seem small when considered as a percentage of the total economy, the positive direction of the impacts indicate that the California economy is highly unlikely to suffer negative impacts from achieving the climate change emission reduction targets as directed by the Governor's Executive Order. Rather, implementation of the suite of strategies indicates a positive net impact on the economy. Refinement of the strategy cost and saving estimates, which is planned for the near future, will provide further details regarding the impacts of strategy implementation on the California economy.

With the exception of the Green Building Initiative (from Table 5-1) and the Table 5-2 strategies for which reductions are not reported, the economic impacts shown in Tables 8-1 and 8-2 reflect the combined effect of all of the strategies (those underway and those proposed). The strategies not included in this analysis will be included in the subsequent refined analysis along with updated costs and savings information for the strategies analyzed thus far. However, the inclusion of these additional strategies is not expected to change the fundamental conclusions presented in this analysis because the additional strategies are, in total, expected to result in a net savings.

Discussion of the Economic Assessment of the Strategies Already Underway in California: One key observation on the strategies already underway is that almost all of them result in increased energy efficiency, which historically been shown to be highly cost effective. It is thus expected that the net effect of strategies underway, by themselves, will be to benefit the economy by providing additional jobs and income. As previously indicated, a subsequent economic analysis will draw on refined cost and savings information for these strategies

to support a more robust macroeconomic assessment of the individual strategies as well as their combined impact. Discussions of the strategies already underway are presented below. The cost and savings estimates are preliminary and are already being evaluated for refinement.

The Vehicle Climate Change Standards strategy was developed to support a regulation approved by the Air Resources Board in 2004. The staff report including the economic analysis is fully documented and was the subject of several public workshops. For example, the ARB economic analysis of the strategy concluded that by 2020, jobs increase by 53,000. The benefits result from operating cost savings by consumers which in turn are spent on other goods and services, generating additional jobs and income beyond what the economy normally would produce. Further, the Diesel Anti-idling strategy is expected to save several hundred million over its implementation by reducing diesel fuel consumption⁴. Because of the savings, its impact on the economy is expected to be positive.

In general, energy efficiency programs positively impact the economy. Most of the strategies already underway concern efficiency improvements. Although the State agencies developing these strategies may not have completed a refined assessment of the associated costs and savings, analyses of similar strategies by universities and institutes have shown net benefits for these strategies, and thus, positive impacts on the economy. Such strategies include Investor Owned Utility Energy Efficiency Programs, Building and Appliance Energy Efficiency Programs, Achieve 50% Statewide Recycling Goal, and Fuel-Efficient Replacement Tire and Inflation Programs. In total, these programs will almost certainly benefit the economy by producing additional jobs and income for California.

The Green Building Initiative is expected to produce net benefits and therefore positively impact the economy. Based on historical experience, every dollar spent on energy efficiency typically provides about \$2 in benefits. As indicated, the Green Building Initiative will be folded into the subsequent refined analysis.

The California Public Utilities Commission (CPUC) is currently reviewing a statewide solar incentive program proposal. If adopted by the CPUC in January 2006, the proposed California Solar Initiative (CSI) will provide close to \$2.9 billion in incentives between 2007 and 2017. The program is anticipated to bring on line or displace 3,000 MW of power. As costs and savings estimates are further developed they will be included in a refined economic impact analysis of the climate change emission reduction strategies.

⁴ ARB 2005b. Notice Of Public Hearing To Consider Requirements To Reduce Idling Emissions From New And In-Use Trucks, Beginning In 2008. At <http://www.arb.ca.gov/regact/hdvidle/isor.pdf>

In addition to the Solar Initiative, the CPUC commissioned a report entitled "Achieving a 33% Renewable Energy Target" to identify feasibility and next steps to accelerate and expand the current CPUC Renewable Portfolio Standard program. The report determines that after the initial infrastructure costs are borne, the resulting benefits to ratepayers in 2021 and beyond are net positive. Using the CEC's long-term forecast of natural gas prices, the report finds that ratepayers would likely realize a net benefit over a 20 year period.

Discussion of Economic Impacts of the Strategies Needed to Meet California's Targets: All of the strategies presented in Table 5-2 (proposed strategies) where estimated climate change emission reductions are available were included in the analysis that generated the results shown in Tables 8-1 and 8-2. Several sources were drawn on to identify preliminary cost information including analyses done by UC Berkeley, and the Tellus Institute⁵. Many of the strategies have implementation costs. However, several strategies also have savings that may cover or exceed the costs.

8.3 Discussion

The economic impacts presented in this analysis are from the combined strategies listed in Tables 5-1 and 5-2 for which preliminary cost information is available. Some of the strategies in Tables 5-1 and 5-2 have net costs while others have net savings typically due to decreased operating costs. Those with net costs would be expected to adversely affect job growth if considered in isolation. However, those with savings will increase job growth and income. For example, the Heavy Duty Vehicle Emission Reduction Strategy from Table 5-2 would be expected to lower the operating costs of transporting goods.

Lower costs of producing a certain amount of goods or services lead to more economic activity and create more jobs and income as people spend savings from the lower costs.

The refined analysis would be expected to provide additional information to facilitate a focused consideration of each strategy with respect to several factors including cost effectiveness. Further, the refined analyses can include additional strategies that may be identified by stakeholders. Specifically, stakeholders may identify additional cost-effective strategies that have the potential to provide additional emission reductions. However, as with the analysis presented here, a key product of the subsequent refined analysis will include the macroeconomic impacts of the suite of strategies rather than each strategy.

⁵ Tellus Institute 2004. California Climate Leadership: Strategies to Reduce Global Warming Emissions. Draft

Subsequent analysis of the strategies may also be affected by overall program implementation methods that have the potential to promote further cost reductions or savings. For example, cap-and-trade policies can unleash internal innovative powers of the private sector to adopt and invest in processes and methods that lower energy use and increase efficiency. Like energy efficiency standards that have been shown to create jobs, the innovative efforts induced by cap-and-trade or other similar tools would likely further enhance the cost effectiveness of reaching the climate change emission reduction targets.

Many of the strategies that end up with net costs may have benefits that are not directly estimated or may not be the focus of the climate change emission reduction efforts. For example, the afforestation strategy has a net cost. However, planting forests may provide indirect benefits to the public or other sectors of the economy that are not captured in this analysis. Specifically, strategies currently believed to result in a net cost may actually provide a savings when both direct and indirect benefits are considered.

Further, the benefits of strategies that already indicate a net savings may not be fully recognized in a conventional economic analysis. For example, several of the energy efficiency strategies may also facilitate increased security through further energy independence. Such indirect benefits should at least be qualitatively identified and considered when evaluating the strategies.

Finally, it may not be appropriate to assign all of the costs of the strategies currently underway to the climate change emission reduction efforts given that there are typically other considerations that contributed to the policy. Specifically, many of the strategies that are underway are being pursued to achieve other objectives (e.g., the Diesel Anti-Idling Strategy from Table 5-1 is focused on reducing the population's exposure and risk associated with diesel particulate emissions as well as reducing smog precursors) with the associated climate change emission reductions being an added benefit. As with the Table 5-1 strategies, many of the proposed strategies in Table 5-2 have the potential to address other programmatic objectives beyond climate change.

8.4 Summary

Based on this preliminary analysis, it appears that the climate change emission reduction targets can be met without adversely affecting the California economy. It is possible to adopt a suite of strategies in a manner that continuously benefits the economy. The strategies that focus on increased energy efficiency and produce net savings can greatly contribute to economic activity while reducing climate change emissions. Further, technology improvements and innovative implementation of strategies currently estimated to have net positive costs may, in the long-run, result in net savings.

As refined cost information is developed for the strategies, a subsequent analysis of the economic impacts will be performed. In addition to characterizing the overall impacts of the strategies on California's economy, the subsequent analysis will allow individual strategies to be evaluated. The analysis may also facilitate the identification and inclusion of new cost-effective strategies that are not currently presented in Table 5-2. The analysis will also further inform decision-makers on the approach to strategy implementation that maximizes both environmental benefits and the benefits to the economy.